Characteristics Predicting Nursing Home Admission in the Program of All-Inclusive Care for Elderly People

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Purpose: This study determined overall risk and predictors of long-term nursing home admission within the Program of All-Inclusive Care for the Elderly (PACE). **Design and Methods:** DataPACE records for 4,646 participants aged 55 years or older who were enrolled in 12 Medicare- and Medicaid-capitated PACE programs during the period from June 1, 1990, to June 30, 1998, were obtained. Participants were enrolled for at least 30 days and had baseline evaluations within 30 days of enrollment. Cox proportional hazard models predicting an outcome of nursing home admission of 30 days or longer were estimated. **Results:** The cumulative risk of admission to nursing homes for 30 days or longer was 14.9% within 3 years. Individuals enrolled from a nursing home were at very high risk for future admission, with a relative risk of 5.20 when compared with those living alone. Among individuals enrolled in PACE from the community, age, instrumental activity of daily living dependence, and bowel incontinence were predictive of subsequent nursing home admission. Asians and Blacks had a lower risk of institutionalization than Whites. However, other characteristics were not independently predictive of institutionalization, namely poor cognitive status, number of chronic conditions, activity of daily living deficits, urinary incontinence, several behavioral disturbances, and duration of program operation. Before adjusting for other variables, there was substantial site variability in risk of nursing home admission; this decreased considerably after other characteristics were adjusted for. **Implications:** Despite the fact that 100% of the PACE participants were nursing home certifiable, the risk of being admitted to a nursing home long term following enrollment from the community is low. The presence of some reversible risk factors may have implications for early intervention to reduce risk further, although the effect of these interventions is likely to be modest. Individuals who received long-term care in a nursing home prior to enrollment in PACE remain at high risk of readmission, despite the availability of comprehensive services.

Key Words: Long-term care; Managed care; Health services utilization; Nursing homes; PACE

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The United States is an aging country; in the year 2000, 35 million Americans were over the age of 65 (U.S. Department of Commerce, 2001). As the proportion of older adults keeps growing, it is expected that the number of individuals with long-term-care needs will also continue to expand. These care needs span a wide range, from the need for occasional informal care to the requirement for permanent, institutionally based care.

Kemper and Murtaugh (1991) estimated that, of individuals who turned 65 in 1990, 43% would enter a nursing home before they died, and over half of those who entered a nursing home would be there for more than a year. Institutionalization causes many potential psychological, social, and physical burdens. Because of this, many individuals who are eligible for

nursing home admission would prefer to remain in the community. Institutionalization is also expensive, both in terms of public and private finances, costing $98.90 billion per year in 2001, with the majority paid for by Medicaid ($47.5 billion) and Medicare ($11.7 billion; Centers for Medicare and Medicaid Services, 2003).

These concerns have led to the development and evaluation of several different long-term-care models. Most, such as the Social Health Maintenance Organization, the National Long Term Care Channeling Demonstration, and the Triage Demonstration, have had limited success in reducing nursing home admission rates or in controlling costs (Weissert & Hedrick, 1994).

The Program of All-inclusive Care for the Elderly (PACE) was developed as another long-term-care alternative. It is a community-based, comprehensive, capitated system of acute and long-term care, targeted toward low-income, nursing-home-certifiable older adults (Eng, Pedulla, Eleazer, McCann, & Fox, 1997). Its stated goals are to maintain or improve the functional independence of its participants and thus prevent or delay institutionalization, at the same or lower cost than nursing home care. Individuals who choose to enroll in PACE are not only frail but also have strong preferences for remaining in the community. Care is provided primarily at a day health center, by an interdisciplinary team that individualizes care based on the individuals' needs. Care is also provided across the continuum, from hospital to home care to nursing home care.

In the Balanced Budget Amendment of 1997, Congress established PACE as a permanently recognized provider type under Medicare and Medicaid. Currently, over 9,000 participants are cared for in 31 programs, and 40 providers are enrolled in the National PACE Association's Exploring PACE program, with plans to start a PACE program (National PACE Association, 2004).

A study by Abt Associates (Chatterji, Burstein, Kidder, & White, 1998) showed a reduction in nursing home utilization among enrollees in PACE versus nonenrollees, but the epidemiology of nursing home use in the growing PACE population has yet to be defined. As the PACE model expands, it will become more important to understand which enrollees are at highest risk for institutionalization.

Understanding the epidemiology of nursing home admissions in PACE has clear implications for both practice and policy. The identification of potentially reversible risk factors on enrollment would allow for the development of interventions to prevent nursing home admission, because this is a stated goal of PACE programs. These findings would therefore inform practice patterns in PACE and help guide program development. Nonreversible risk factors that are identified should be investigated prospectively to see whether individuals with these characteristics are, in fact, best served by the PACE model.

Alternatively, there may be additional interventions that might be tried within the program to reduce their risk.

Our objective in this study is to describe the epidemiology of nursing home admission among PACE enrollees. We first evaluate the risk of long-term nursing home utilization in this specialized population and then identify the specific predictors of nursing home utilization on enrollment in the PACE program.

Methods

Study Population

We included the 6,101 participants aged 55 and older who were enrolled in all 12 dually capitated (Medicare and Medicaid) PACE programs between June 1, 1990 and June 30, 1998 in the study. The first PACE programs initially received a capitation payment through Medicaid, to provide Medicaid-based services, such as day care and nursing home care. When programs had operated successfully under Medicaid capitation, they applied for Medicare capitation, which covered Medicare-based services, such as hospitalization. We limited this analysis to the dually capitated PACE programs for several reasons. First, these programs are more mature. They therefore are more experienced in optimizing their system of care for maintaining frail older adults in the community. Second, because the sites are mature, they have standardized their data-collection systems to accurately describe the participant population. Finally, under the regulations governing PACE as a provider type, new programs are dually capitated from the start. Therefore, our results are more closely applicable to current and future programs.

We excluded the 1,382 participants who were not assessed within 30 days of enrollment and the 73 participants who were in the program for fewer than 30 days from the study, leaving a total of 4,646 PACE participants (76.2% of the original group) for analysis. We excluded the former group for two reasons: First, our study evaluates baseline risk factors. Many participants are enrolled at a time of rapid change. Assessments that were not performed within 1 month of enrollment might therefore not accurately represent a participant's baseline status. Second, the study is looking at predictors of nursing home admission. The PACE program intervenes to change risk, so that measurements that were completed after a month might reflect the program's activities rather than the individual's baseline risk. The excluded group, mostly enrolled in two sites, did not differ from the rest in terms of gender or risk of nursing home admission, but they were slightly younger, with a mean age of 77.2 versus 78.7. Results were similar when the analyses were repeated excluding these two sites, indicating that this exclusion does not bias the results.

Source of Data

We used secondary data collected by PACE from the 12 original sites. Because PACE was a demonstration project during the study period, each site was required by the Health Care Financing Administration to collect a standard data set, including baseline sociodemographic, health, and functional status information, as well as regular updates on nursing home utilization. Data were compiled at a central data-coordinating center.

Reliability of the data was ensured in three ways: through a training program for personnel at the sites who were responsible for entering data; by having uniquely designed data-entry software that was used in all sites; and by a manual that gave detailed explanations of information to be entered. The approaches used to ensure data quality have been previously described (Mukamel, Temkin-Greener, & Clark, 1998).

Variables

We defined the outcome variable as a nursing home admission of 30 days or longer. We used the 30-day criterion because many PACE programs use short-term nursing home stays to provide subacute, respite, and hospice care. These stays are different from long-term institutionalization. In addition, a 30-day stay has face validity, in that it constitutes a substantial duration for the patient and substantial utilization of resources for the program.

We chose independent variables in part on the basis of Andersen's Behavioral Model of health services use, incorporating characteristics that had previously been shown to be risk factors for nursing home admission in other populations (Andersen, 1995). This model uses predisposing characteristics, such as demographics and social structure, enabling resources, such as family and community (which we measure with certain programmatic variables), and need, such as functional status, health status, and cognitive status, to determine the risk of health services utilization. This framework has been widely used in predicting the use of health services, including nursing home admission (Wolinsky, Callahan, Fitzgerald, & Johnson, 1993).

Demographics included age, gender, and living situation prior to enrollment. We categorized the living situation prior to enrollment in PACE into four groups: living alone, living with informal caregiver(s), living with formal caregivers (group home, single-room occupancy hotel, foster care or group home, and home with paid family caregiver), and living in a nursing home. The last category applied only to individuals who had lived in a nursing home for long-term care, and these participants would be discharged to a community setting prior to enrollment in PACE. We coded individuals who were enrolled in PACE following a short nursing home stay (e.g., for rehabilitation), with a plan for discharge to home, according to their home living situation.

We used two programmatic variables for this study: site, and program age, measured as time from dual capitation of the program to participant enrollment. We used the latter measure to evaluate whether site maturity was related to nursing home admission.

Activities of daily living (ADLs) were assessed by a registered nurse who, as part of PACE training, received extensive instruction on the measurement of ADLs and instrumental ADLs (IADLs) and who was evaluated for reliability through grading of assessments of videotaped patients. Katz (1983), defined six ADLs: bathing, dressing, toileting, transferring, continence, and feeding. All measurements other than continence were tallied and reported as the number of ADLs requiring either supervision or assistance from 0 to 5, with higher numbers reflecting more dependence. IADLs were totaled in the same way. The IADLs assessed were preparing meals, shopping, doing housework, doing laundry, performing heavy chores, managing money, taking medications, and using transportation.

We dichotomized bowel and bladder incontinence to present or absent. Several behavioral problems were recorded: Wandering was defined as straying as a result of impaired judgment. Verbal disruption was defined as yelling, baiting, threatening, or exhibiting other similar behavior. Physical aggression was defined as being assaultive or combative to self or others with intent for injury. Regressive behavior was defined as childish, repetitive, or antisocial physical behavior that creates disruption with others. Hallucinations were defined as visual, auditory, or tactile perceptions that have no basis in reality (PACE Data-Collection Manual, 1993). We dichotomized variables to present or absent.

We dichotomized vision, hearing, and communication difficulties to present or absent. We considered participants to have communication difficulties if they had expressive or receptive problems.

Self-reported health status included four states: excellent, good, fair, or poor. We measured mental status by using the 10-point Short Portable Mental Status Questionnaire (SPMSQ). The number of errors or unanswered responses is recorded from 0 to 10, with higher numbers representing higher levels of cognitive impairment (Pfeiffer, 1975; Welch & West, 1999). We dichotomized SPMSQ as severe cognitive impairment (8–10 errors) versus moderate, mild, or no impairment (fewer than 8 errors). We tallied the number of chronic conditions from a list of 59 conditions, recorded by the program physician. We measured time from participant enrollment to nursing home admission. We censored participants if they died or disenrolled from the program, or when data collection ended.

Statistical Analyses

Descriptive statistics portray characteristics at enrollment. We performed comparisons between sites by

Table 1. Cumulative Risk of Nursing Home Admission in PACE

After No. of Years	No. Admitted During the Year	Cumulative Risk (%)
1	246	6.3
2	122	11.1
3	54	14.9
4	29	18.3
5	16	22.0
6	8	26.0

Notes: PACE = Program of All-Inclusive Care for the Elderly. For the table, $N = 4,646$.

using chi-square and analysis of variance (ANOVA) testing.

Because of the concerns that an impending nursing home admission might trigger disenrollment, we compared baseline risk factors of disenrollees versus nondisenrollees. We found that they did not differ as to age, gender, cognitive status, ADLs, number of chronic conditions, or prevalence of urinary incontinence. Disenrollees had a slightly higher level of IADL independence, being independent in 0.74 versus 0.60 IADLs.

We estimated Cox proportional hazard models to evaluate risk over time. We constructed models to evaluate site-based risk, as well as to assess the contribution of individual risk factors in multivariate modeling. In addition to the base model that included all the independent variables, we estimated a model excluding ethnicity. We were motivated by concerns about high collinearity between sites and ethnicity, as some PACE programs tend to serve predominantly one ethnic group.

Finally, because of the difference in risk between those who were recruited into PACE from a nursing home and those who were enrolled from a community setting, we looked at differences between these two groups using a bivariate analysis.

Results

Of the 4,646 study participants, 475 were admitted for a nursing home stay of 30 days or longer, with the highest risk, 6.3% of the population, occurring during the first year (Table 1). After accounting for censored data, we found that there was a cumulative risk of 14.9% over the 3 years following admission to the program, and 26.0% after 6 years. Of the 1,380 participants who died during the entire study period, 1,111, or 80.5%, died without having spent 30 days or more in a nursing home. In other words, fewer than 20% of participants who died spent 30 days or more in a nursing home prior to death.

Study participants are elderly and predominantly female, with a mean age of 78.7 (Table 2). They have a high level of functional dependence, and 54.3% report urinary incontinence.

Table 2. Characteristics of the PACE Study Population at Enrollment

	M or %	
Characteristic	Overall	Range for Sites
Sociodemographic		
Age (mean)	78.7	75.3–79.9
Gender (% female)	71.0	64.6–80.4
Living situation (%)		
Living alone	33.3	2.1–53.1
Admitted from a nursing home	4.0	0.7–14.9
Race (% White)	49.3	4.0–91.3
Health		
Excellent or good self-reported health status (%)[a]	52.4	40.2–72.2
Cognitive impairment (%)[b]	44.8	7.5–57.3
Moderate	20.3	0.7–33.6
Severe		
No. of chronic conditions (M)	6.7	5.0–8.7
Function		
ADL dependence (M)[c]	2.7	1.8–3.4
IADL dependence (M)[d]	7.5	6.4–7.9
Bowel incontinence (%)	24.8	17.3–45.7
Urinary incontinence (%)	54.3	38.7–86.2
Hallucinations (%)	8.5	3.6–17.2
Regression (%)	8.1	1.9–70.1
Physical aggression (%)	5.2	2.2–12.0
Verbal disruption (%)	9.8	5.1–20.7
Wandering (%)	12.7	4.3–21.6
Vision difficulties (%)	48.4	32.6–60.5
Hearing difficulties (%)	33.0	14.9–44.0
Communication difficulties (%)	27.8	14.5–43.3
Programmatic		
Program age at time of participant enrollment (in years; M)	5.4	0.5–11.4
No. of participants (M)	387	46–936

Notes: PACE = Program of All-Inclusive Care for the Elderly; ADL = activity of daily living; IADL = instrumental ADL. For Range for Sites, all predictor variables showed a difference between sites, with a value of $p < .0001$ for each variable. For the table, $N = 4,646$.

[a]This is versus fair or poor self-reported health status.

[b]Moderate = 3–7 incorrect answers out of 10 on the Short Portable Mental Status Questionnaire; severe = 8–10 incorrect answers.

[c]This is the number of ADLs (bathing, dressing, toileting, transfer, feeding) requiring assistance or supervision.

[d]This is the number of IADLs (preparing meal, shopping, doing housework, doing laundry, performing heavy chores, managing money, taking medications, and using transportation) requiring assistance or supervision.

In ANOVA and chi-square testing, there were substantial differences between PACE sites with respect to all of the predictor variables, with a value of $p < .0001$ for each. For example, the range of individuals living alone was 2.1% to 53.1% in the different sites, and the prevalence of dementia also varied substantially, with 0.7% to 33.6% of site participants having eight or more errors on the SPMSQ. Differences in participant profiles have been more fully characterized by Wieland, Lamb, Wang, and colleagues (2000).

Table 3. Nursing Home Admission RR by Site, Using the Cox Proportional Hazard Model

Site	n	Unadjusted RR RR[a]	Unadjusted RR 95% CI	Adjusted RR[b] RR[a]	Adjusted RR[b] 95% CI
1	147	0.90	(0.44, 1.81)	1.01	(0.31, 3.32)
2	427	2.44****	(1.71, 3.48)	0.99	(0.50, 1.95)
3	382	1.40	(0.93, 2.92)	0.92	(0.44, 1.91)
4	425	1.85**	(1.22, 2.82)	0.97	(0.48, 1.93)
5	524	2.53****	(1.81, 3.54)	1.33	(0.66, 2.67)
6	248	1.50	(0.92, 2.45)	0.94	(0.37, 2.41)
7	466	4.24****	(3.08, 5.84)	2.28*	(1.15, 4.54)
8	639	1.09	(0.73, 1.62)	0.58	(0.27, 1.24)
9	46	5.72***	(2.28, 14.3)	2.35	(0.64, 8.54)
10	276	1.20	(0.68, 2.12)	0.60	(0.25, 1.46)
11	130	0.87	(0.35, 2.17)	0.46	(0.13, 1.60)
On Lok	936	1.00	—	1.00	—

Notes: RR = relative risk; CI = confidence interval. For the table, N = 4,646; n for unadjusted and adjusted RRs are 4,646 and 4,235, respectively (numbers differ because of missing values).
[a]RRs use On Lok as a reference.
[b]This is adjusted for age, gender, race, living situation, cognitive status, number of chronic conditions, dependence in activities and instrumental activities of daily living, urinary and bowel incontinence, hallucinations, regression, physical aggression, wandering, verbal disruption, hearing, vision, and communication impairment, and program age at participant enrollment.
*p < .05; **p < .005; ***p < .0005; ****p < .0001.

Before we adjusted for other variables in a Cox proportional hazard model, no sites had a significantly lower rate of nursing home admission than On Lok, the prototype for the PACE model. Five of the 11 other sites had a significantly higher rate, with odds ratios ranging from 1.85 to 5.72. Once we entered other variables into the model, however, only 1 of the 11 other sites had a risk that was significantly higher than On Lok, with an odds ratio of 2.28 (Table 3).

In a multivariate Cox proportional hazard model that included all risk factors, the most substantial risk factor for nursing home admission was being enrolled into PACE from a nursing home (relative risk or RR = 5.20; see Table 4). Overall, 170 participants in the model (4.0%) were enrolled from a nursing home, and 76 of these individuals required subsequent admission to a nursing home during the study period. This represents a 72.5% cumulative risk over the course of the study, after accounting for censored data.

In addition, age (RR = 1.12 per additional 5 years), race (RR = 0.68 for Blacks vs. Whites) and IADL dependency (RR = 1.15 for each additional IADL requiring assistance) were significant predictors of nursing home admission for the entire group. For those who were admitted from the community, bowel incontinence was also predictive of subsequent nursing home admission, and Asian race was protective relative to White race. Visual impairment was the only significant predictor of nursing home admission in the group admitted from a nursing home.

We performed another regression to address issues of collinearity between site and ethnicity. In a model excluding ethnicity, two programs had a higher risk of nursing home admission than On Lok (RRs = 1.80 and 3.23), and two other programs had borderline increased risk (RR = 1.60 and p = .09, and RR = 2.91 and p = .08, respectively). Men also had a higher risk than women (RR = 1.25, p = .04; data not shown for this regression).

Table 4. Nursing Home Admission RR for PACE Participants

Risk Factor	All Enrollees RR	All Enrollees 95% CI	Enrolled From Community RR	Enrolled From Community 95% CI	Enrolled From NH RR	Enrolled From NH 95% CI
Age (per 5-year difference)	1.12*	(1.05, 1.18)	1.15*	(1.07, 1.23)	0.92	(0.78, 1.09)
Enrolled from NH (vs living alone)[a]	5.20*	(3.81, 7.08)	—	—	—	—
Race (vs White)[b]						
Black	0.68*	(0.52, 0.90)	0.64*	(0.48, 0.86)	—[c]	—[c]
Asian	0.58	(0.33, 1.00)	0.43*	(0.23, 0.80)	—[c]	—[c]
IADL dependence (per additional)	1.15*	(1.02, 1.31)	1.17*	(1.02, 1.35)	1.04	(0.78, 1.40)
Bowel incontinence	1.26	(0.99, 1.60)	1.32*	(1.02, 1.72)	0.94	(0.49, 1.78)
Site (Site 7 vs On Lok)[d]	2.28*	(1.15, 4.54)	3.10*	(1.43, 6.74)	—[c]	—[c]
Visual impairment	0.95	(0.78, 1.16)	0.86	(0.69, 1.06)	1.75*	(1.05, 2.92)

Notes: Table shows a multivariate analysis, using a Cox proportional hazard model. PACE = Program of All-Inclusive Care for the Elderly; RR = relative risk; CI = confidence interval; IADL = instrumental activity of daily living; NH = nursing home. For all enrollees, enrolled from the community, and enrolled from a nursing home, n = 4,235, n = 4,066, n = 169, respectively. Numbers differ from total (N = 4,646) because of missing values.
[a]Living with either informal or formal caregiver at baseline vs living alone was not significantly associated with the outcome.
[b]Hispanic and American Indian race vs White was not significantly associated with the outcome.
[c]Unable to include because of high correlations.
[d]All other sites were not significantly associated with the outcome.
*p < .05 (significant). Gender, severe cognitive impairment, number of chronic conditions, dependence in activities of daily living, urinary incontinence, hallucinations, regression, physical aggression, wandering, verbal disruption, hearing impairment, communication impairment, and program age at participant enrollment were entered into the model, but they were not significantly associated with the outcome.

Table 5. Characteristics of Individuals Enrolled in PACE From Nursing Homes or the Community

Characteristic	Enrolled from NH (n = 178)	Enrolled from Community (n = 4,468)	p
Age (M)	80.0	78.6	.034
Male (%)	31.5	28.9	.455
Race (%)			.004
White	61.8	48.1	
Black	20.8	24.3	
Hispanic	5.1	11.8	
Asian	11.8	14.8	
American Indian or other	0.6	1.0	
Severe cognitive impairment (%)[a]	25.4	20.1	.089
No. of chronic conditions (mean)	6.6	6.7	.567
Dependence (M)			
ADL[b]	2.9	2.7	.106
IADL[c]	7.6	7.4	.079
Incontinence (%)			
Bowel	25.4	24.7	.835
Urinary	50.8	54.2	.376
Hallucinations (%)	10.7	8.5	.311
Regression (%)	10.7	7.8	.158
Physical aggression (%)	11.2	4.9	< .001
Verbal disruption	17.4	9.6	< .001
Wandering (%)	16.3	12.6	.154
Impairment (%)			
Vision	44.6	48.6	.302
Hearing	32.2	32.9	.857
Communication	36.5	27.4	.008
Time from dual capitation to enrollment (years)	4.7	5.4	.019
On Lok (%)	14.6	20.6	.050

Notes: ADL = activities of daily living; IADL = instrumental ADL; NH = nursing home; PACE = Program of All-Inclusive Care for the Elderly.
[a]This is 8–10 incorrect answers out of 10 on the Short Portable Mental Status Questionnaire.
[b]This is requiring assistance or supervision in ADL (bathing, dressing, toileting, transferring, or feeding).
[c]This is requiring assistance or supervision in IADL (preparing meals; shopping; doing housework, laundry, or heavy chores; managing money; taking medications; using transportation).

Because being admitted from a nursing home was such a strong predictor of long-term nursing home admission within PACE, we looked at differences on enrollment between those admitted from a nursing home versus the community (Table 5). Individuals admitted from a nursing home were significantly more likely to have communication impairment and to display verbal disruption and physical aggression. They were also older, and they were admitted earlier in the course of the program's operation. There was a wide disparity in the proportion of participants who were enrolled from a nursing home, according to site. On average, 4.0% were enrolled from a nursing home, with a range for the sites of 0.7% to 14.9% (Table 2).

Discussion

PACE is a community-based long-term-care program designed for frail older adults, with a goal of maintaining function so as to delay or prevent the need for nursing home admission. This article describes the risk of long-term nursing home utilization, defined as 30 days or longer, in this population.

Our study demonstrates a relatively low rate of nursing home utilization in the overall group. PACE enrollees had a cumulative risk of less than 15% in 3 years following enrollment, despite the fact that 100% of the enrollees were certifiable for nursing home care.

Because we did not have a comparison group for this study, it is not possible for us to determine what proportion of enrollees would have required nursing home admission had they not enrolled in PACE. Clearly, there are many frail older adults living in the community who are eligible for nursing home admission who remain in the community and never access institutional care, because of their personal and financial resources as well as their goals and wishes. However, a previous study by Abt showed a substantial reduction in nursing home admissions for individuals enrolled in PACE, compared with those who chose not to enroll (Chatterji et al., 1998). In that study, 9.8% of PACE enrollees were admitted to nursing homes during the first 6 months of the study, versus 30.3% of those who apply but do not enroll. The risk of nursing home admission is substantially higher for both enrollees and nonenrollees in that study because the researchers evaluated any admission, whereas in our study we investigate those lasting 30 days or longer.

It is interesting to note that, of the 1,380 participants who died during the course of the study, fewer than 20% spent 30 days or more in a nursing home prior to death. This is consistent with the wishes of many older adults, of whom 65% say that they would prefer to spend their last days at home or in hospice. Unfortunately, in the general population, 25% die in a nursing home, and 38% spend at least part of the year prior to death in a nursing home (Hogan, Lunney, Gabel, & Lynn, 2001).

Limitations

In this study we evaluated characteristics at enrollment as predictors of long-term institutionalization. Nursing home admissions are often precipitated by crisis situations, either because of a sudden change in a patient's functional status or because of his or her caregiving situation (Fortinsky, Covinsky, Palmer, & Landefeld, 1999). Characteristics on admission would not reflect the changes that would in turn precipitate a nursing home admission. However, our purpose in this study was to identify baseline characteristics that lead to increased risk for institutionalization, so that early attempts to treat

162

these risk factors could be instituted for participants at highest risk. In addition, a previous study suggests that the functional status of PACE enrollees stays fairly stable over time (Mukamel et al., 1998).

The Importance of Preenrollment Nursing Home Stays

The strongest risk factor for being admitted to a nursing home after enrollment in PACE was enrollment following a long-term nursing home stay. Individuals who were living long term in a nursing home prior to enrollment were five times more likely to be readmitted to a nursing home than were those who lived alone in the community on enrollment, with a cumulative risk of 72.5% after we accounted for censored data. Studies of usual care have also identified previous nursing home utilization as a strong risk factor for institutionalization (Coughlin, McBride, & Liu, 1990; Jette, Branch, Sleeper, Feldman, & Sullivan, 1992; Pearlman & Crown, 1992; Wolinsky, Callahan, Fitzgerald, & Johnson, 1992).

Because of the concern that this baseline living situation might be a surrogate for poorer functional status and other characteristics that might be predictors of nursing home admission, we did a bivariate analysis, looking at differences between the individuals enrolled from a nursing home and those enrolled from the community. This analysis showed that individuals enrolled from the nursing home were indeed different: they were older, and they were more likely to have poor cognitive status, physical aggression, verbal disruption, and communication impairment. Thus, it may be that previous nursing home admission is related in part to issues of caregiver fatigue (Jette, Tennestedt, & Crawford, 1995), which may in turn result from behavioral disturbances (Jann & Brandt, 2000; Kameda et al., 2001). However, this does not account for all of the additional risk, because even after we adjusted for these other characteristics, previous nursing home admission remained a strong risk factor.

Another explanation is that an individual who has previous long-term utilization of a nursing home may demonstrate a greater willingness to be admitted to a nursing home than someone who has remained in the community prior to enrollment in PACE. In addition, a person who has lived in a nursing home for long-term care may experience a change in community-based resources (e.g., selling of a house or experiencing a change in social support), making a transition back to the community more difficult, even with the substantial support of the PACE model.

Because the risk of readmission is so high in this subgroup, PACE programs should prospectively evaluate this group carefully, assessing their support systems, community resources, and motivation, to determine whether these individuals can actually benefit from the PACE model.

Individuals who were admitted from nursing homes were enrolled, on average, earlier in the life of a program than those who were admitted from the community. It may be that, as programs mature, they are better able to identify those who will be able to benefit from PACE services in order to remain in a community setting. Another possibility is that as programs' services become known in the community, they are better able to access individuals who are at high risk for institutionalization but who have yet to be admitted to a nursing home.

Predictors of Nursing Home Admission in PACE Participants Admitted From the Community

Of the 4,066 individuals who were admitted to PACE from the community, a few characteristics were predictive of subsequent nursing home admission. These were age, IADL dependence, and bowel incontinence. Asians and Blacks had a significantly lower risk of nursing home admission than Whites. Some of these risk factors have implications for prevention within the program, although their impact is likely to be small, given the modest relative risks. Because IADL impairment is a risk factor for subsequent nursing home admission, rehabilitation efforts aimed at improving function or providing increased personal assistance with these activities may help reduce institutionalization. Bowel incontinence is frequently related to dementia and psychiatric illness. This may lead to caregiver fatigue, which in turn may lead to nursing home entry. Thus, more intensive efforts at treatment as well as caregiver education and support may be warranted.

The finding of a higher risk of nursing home admission among Whites than among other groups is consistent with previous studies demonstrating ethnic and racial differences in rates of institutionalization in other models of care (Bauer, 1996; Coughlin et al., 1990; Wolinsky et al., 1993). However, because each PACE program has a different ethnic mix, it is unclear whether the excess risk among Whites was truly due to racial disparities or was rather due to program differences. When we removed ethnicity from the model, the difference in risk between sites became more pronounced. With the development of the PACE model in a growing number of locations, and with increased variability in racial compositions between sites, it may be possible in the future to evaluate the effects of ethnicity versus program.

It is striking that many of the predictors for institutionalization that have been seen in usual care were not risk factors in this population. Although number of chronic conditions (Greenberg & Ginn, 1979; Miller & Weissert, 2000), ADL status (Greenberg & Ginn; Liu, Coughlin, & McBride, 1991; Miller & Weissert, 2000; Pearlman & Crown, 1992; Shapiro & Tate, 1985; Weissert & Cready, 1989; Wolinsky et al., 1992), multiple behavioral issues

(Miller & Weissert; Pearlman & Crown), and dementia (Branch & Jette, 1982; Liu et al., 1991; Miller & Weissert; Pearlman & Crown) have been shown in studies in usual care to be important risk factors for institutionalization, they were not associated with statistically significant differences in risk of nursing home admission in our study.

One explanation for the lack of association of traditional risk factors with nursing home admission in PACE is a selection effect of the program. A primary goal of PACE is to maximize function and thus prevent or delay institutionalization. Because all enrollees are nursing home eligible, their enrollment in PACE suggests that they prefer community-based care to nursing home care. A previous study has shown that both patient and family preferences are predictive of nursing home admission (Greenberg & Ginn, 1975). The degree to which these health care wishes counter other risk factors is unclear. A study by Abt Associates (Irvin, Massey, & Dorsey, 1998) showed that enrollees in PACE were, in fact, different from applicants to the program who decided not to enroll, with a higher proportion of women, lower level of education, greater need for assistance with IADLs, and a lower proportion of individuals having a primary medical physician, although there was no significant difference in the proportion previously admitted to a nursing home.

Another explanation may be that the design of the PACE program mitigates the progression and impact of usual risk factors. Program goals described by PACE include (a) maximizing functional status and thereby reducing need by focusing on preventive, rehabilitative, and maintenance care, with frequent monitoring in the day health center; (b) encouraging and facilitating the informal support network through education of the caregiver, by getting the patient out of the house in frequent trips to the day health center, by occasional respite care, and by providing additional formal in-home support when necessary; and (c) providing formal services that the patient and his or her informal support network cannot provide. If effective, these services could be hypothesized to mitigate the impact of traditional predictors on institutionalization risk. This explanation is supported by a previous study that showed that, for unmarried patients with Alzheimer's disease, more home- and community-based services were associated with longer times to nursing home admission (Miller et al., 1998).

A final explanation for the lack of association of traditional risk factors with nursing home admission is the high level of frailty of the PACE participants overall, who need assistance with 2.7 out of 5 ADLs on average. Two mechanisms for this might be posited. First, the prevalence of risk factors might already be so high that this cannot be used to distinguish between the risks of individual enrollees. However, as seen in Table 2, there was considerable variability in the prevalence of many of the predictors, so that individual risk profiles differed substantially for participants.

Second, it is possible that the predictors of institutionalization among a frail population, who are already at high risk of nursing home admission, are different from those in the general population. The literature supporting this hypothesis is mixed. Studies of the National Long Term Care Survey, derived from a population of older adults with at least one ADL or IADL impairment, showed that ADL impairment, cognitive impairment, living alone, age, and race were predictors of institutionalization and time to admission (Liu, McBride, & Coughlin, 1994; Liu et al., 1991). In a study of a frail subpopulation of the National Long Term Care Survey sample (McFall & Miller, 1992), ADLs and cognitive impairment were not predictive of admission, but IADLs, race, and age were, similar to our findings. A study of the National Long Term Care Channeling Demonstration, a frail population at high risk of institutionalization, showed that IADLs had a greater impact on nursing home admission than ADLs, again, similar to our findings (Greene & Ondrich, 1990). Cognition, age, and living alone were also predictors of institutionalization. A study of a frail homebound population receiving long-term home care showed that functional status, living situation, and presence of dementia were not predictive of nursing home admission, but caregiver characteristics were (Tsuji, Whalen, & Finucane, 1995). Thus, it may be that, as individuals become more disabled, they are more affected by their informal support network.

Site Variability

There was substantial site variability with respect to both predictors and the outcome measure. On Lok, the prototype for the other programs, had a significantly lower rate of nursing home admission than 5 of the other 11 sites, and none of the other sites had a lower rate of long-term nursing home use than On Lok. Differences in characteristics at baseline might reflect recruitment practices, as well as the differences in eligibility for nursing home certification between the states. Differences in the outcome might reflect the different populations served, as well as different practice styles, including site-specific programs to reduce risk and team determinations as to when long-term nursing home admission is warranted. It is important to note, however, that once we included individual risk factors in the model, only one site had a significantly higher risk of nursing home admission compared with On Lok. This suggests that the increased risk among the newer programs relative to On Lok is primarily due to baseline characteristics rather than programmatic differences. Furthermore, in a model without ethnicity, some of the site variability remained, suggesting that perhaps ethnicity, rather than other program

characteristics, is an important determinant of nursing home admission. Site variability in PACE has previously been demonstrated for other outcomes as well, namely, hospitalization (Wieland et al., 2000) and mortality (Temkin-Greener et al., 2004), although for the latter outcome measure, site differences persisted even after other characteristics were adjusted for.

Conclusions

Identifying alternatives to institutional care for frail elders is of high importance, both because of the public and private expenditures for institutional care and because of the decreased quality of life that often occurs in such a setting. This study demonstrates that individuals who are enrolled in PACE from the community have a low risk of long-term nursing home admission. The presence of some reversible risk factors in this population may have implications for early interventions to further reduce risk.

Individuals who received long-term care in a nursing home prior to enrollment in PACE remain at high risk of readmission, despite the availability of comprehensive services. Further studies are needed to evaluate this subgroup of individuals more carefully, to determine why they are at such high risk of re-institutionalization despite the multidimensional support provided in the PACE program, and whether, in fact, they can benefit from the PACE model.

References

Andersen, R. M. (1995) Revisiting the behavioral model and access to medical care: Does it matter? *Journal of Health & Social Behavior, 36,* 1–10.

Bauer, E. J. (1996). Transitions from home to nursing home in a capitated long-term care program: The role of individual support systems. *Health Service Research, 31,* 309–326.

Branch, L. G., & Jette, A. M. (1982). A prospective study of long-term care institutionalization among the aged. *American Journal of Public Health, 72,* 1373–1379.

Centers for Medicare and Medicaid Services. (2003). National health care by type of expenditure: Calendar year 2001. Washington, DC: Office of the Actuary, U.S. Bureau of the Census.

Chatterji, P., Burstein, N. R., Kidder, D., & White, A. J. (1998). *Evaluation of the Program of All-Inclusive Care for the Elderly (PACE) demonstration: The impact of PACE on participant outcomes* (HCFA Contract No. 500-96-0003/T04). Washington, DC: Health Care Financing Administration.

Coughlin, T. A., McBride, T. D., & Liu, K. (1990). Determinants of transitory and permanent nursing home admissions. *Medical Care, 28,* 616–631.

Eng, C., Pedulla, J., Eleazer, G. P., McCann, R., & Fox, N. (1997) Program of All-Inclusive Care for the Elderly (PACE): An innovative model of integrated geriatric care and financing. *Journal of the American Geriatrics Society, 45,* 223–232.

Fortinsky, R. H., Covinsky, R. E., Palmer, R. M., & Landefeld, C. S. (1999). Effects of functional status changes before and during hospitalization on nursing home admission of older adults. *Journal of Gerontology: Medical Sciences, 54A,* M521–M526.

Greenberg, J. N., & Ginn, A. (1979). A multivariate analysis of the predictors of long-term care placement. *Home Health Care Service Quarterly, 1,* 75–99.

Greene, V. L., & Ondrich, J. I. (1990). Risk factors for nursing home admissions and exits: A discrete-time hazard function approach. *Journal of Gerontology: Social Sciences, 45,* S250–S258.

Hogan, C., Lunney, J., Gabel, J., & Lynn, J. (2001). Medicare beneficiaries' costs of care in the last year of life. *Health Affairs, 20,* 188–195.

Irvin, C. V., Massey, S., & Dorsey, T. C. (1998). *Evaluation of the Program of All-Inclusive Care for the Elderly (PACE): Determinants of enrollment among applicants to the PACE program* (HCFA Contract No. 500-96-0003/T04). Washington, DC: Health Care Financing Administration.

Jann, M. W., & Brandt, N. (2000). Supportive care for the patient with Alzheimer's disease. *Journal of the American Pharmaceutical Association, 40,* S50–S51.

Jette, A. M., Branch, L. G., Sleeper, L. A., Feldman, H., & Sullivan L. M. (1992). High-risk profiles for nursing home admission. *The Gerontologist, 32,* 634–640.

Jette, A. M., Tennestedt, S., & Crawford, S. (1995). How does formal and informal community care affect nursing home use? *Journal of Gerontology: Social Sciences, 50B,* S4–S12.

Kameda, N., Hattori, A., Nishinaga, M., Tuchimochi, H., Nakahara, K., Oouchi, A., et al. (2001). Quantitative evaluation of the burden of those giving home care for senile dementia of Alzheimer type subjects using the burnout scale of pines. *Japanese Journal of Geriatrics, 38,* 382–387.

Katz, S. (1983). Assessing self-maintenance: Activities of daily living, mobility, and instrumental activities of daily living. *Journal of the American Geriatrics Society, 31,* 721–727.

Kemper, P., & Murtaugh C. M. (1991). Lifetime use of nursing home care. *New England Journal of Medicine, 324,* 595–600.

Liu, K., Coughlin, T., & McBride, T. (1991). Predicting nursing-home admission and length of stay: A duration analysis. *Medical Care, 29,* 125–141.

Liu, K., McBride, T., & Coughlin, T. (1994). Risk of entering nursing homes for long versus short stays. *Medical Care, 32,* 315–327.

McFall, S., & Miller, B. H. (1992). Caregiver burden and nursing home admission of frail elderly persons. *Journal of Gerontology: Social Sciences, 47,* S73–S79.

Miller, S. C., Prohaska, T. R., Furner, S. E., Freels, S., Brody, J. A., & Levy, P. S. (1998). Time to nursing home admission for persons with Alzheimer's disease: The effect of health care system characteristics. *Journal of Gerontology: Social Sciences, 53A,* S341–S353.

Miller, E. A., & Weissert, W. G. (2000). Predicting elderly people's risk for nursing home placement, hospitalization, functional impairment, and mortality: A synthesis. *Medical Care Research Review, 57,* 259–297.

Mukamel, D. B., Temkin-Greener, H., & Clark, M. L. (1998). Stability of disability among PACE enrollees: Financial and programmatic implications. *Health Care Finance Review, 19,* 83–100.

National PACE Association. (2004). *PACE cross-site report.* San Francisco: Author.

PACE/On Lok, Inc. (1983). *PACE data collection manual.* San Francisco: Author.

Palmore, E. (1976). Total chance of institutionalization among the aged. *The Gerontologist, 16,* 504–507.

Pearlman, D. N., & Crown, W. H. (1992). Alternative sources of social support and their impacts on institutional risk. *The Gerontologist, 32,* 527–535.

Pfeiffer, E. (1975). A short portable mental status questionnaire for the assessment of organic brain deficit in elderly patients. *Journal of the American Geriatrics Society, 23,* 433–441.

Shapiro, E., & Tate, R. B. (1985). Predictors of long term care facility use among the elderly. *Canadian Journal of Aging, 4,* 11–19.

Shapiro, E., & Tate, R. (1988). Who is really at risk of institutionalization? *The Gerontologist, 28,* 237–245.

Temkin-Greener, H., Bajorska, A., Peterson, D. R., Kunitz, S. J., Gross, D., Williams, T. F., et al. (2004). Social support and risk-adjusted mortality in a frail older population. *Medical Care, 42,* 779–788.

Tsuji, I., Whalen, S., & Finucane, T. E. (1995). Predictors of nursing home placement in community-based long-term care. *Journal of the American Geriatrics Society, 43,* 761–766.

U.S. Department of Commerce. (2001). *The 65 years and older population.* Washington, DC: Economics and Statistics Administration, U.S. Census Bureau.

Vicente, L., Wiley, J. A., & Carrington, R. A. (1979). The risk of institutionalization before death. *The Gerontologist, 19,* 361–367.

Weissert, W. G., & Cready, C. M. (1989). Toward a model for improved targeting of aged at risk of institutionalization. *Health Services Research, 24,* 485–510.

Weissert, W. G., & Hedrick, S. C. (1994). Lessons learned from research on effects of community-based long-term care. *Journal of the American Geriatrics Society, 42,* 348–353.

Welch, D. C., & West, R. L. (1999). The Short Portable Mental Status Questionnaire: Assessing cognitive ability in nursing home residents. *Nursing Research, 48,* 329–332.

Wieland, D., Lamb, V. L., Sutton, S. R., Boland, R., Clark, M., Friedman, S., et al. (2000). Hospitalization in the Program of All-Inclusive Care for the Elderly (PACE): Rates, concomitants, and predictors. *Journal of the American Geriatrics Society, 48,* 1373–1380.

Wieland, D., Lamb, V., Wang, H., Sutton, S., Eleazer, G. P., & Egbert, J.